

## FACT SHEET

### URANIUM MINING AND MILLING LEGACY in and near Ambrosia Lake, NM

Legacy area addressed in this fact sheet is from Milan, New Mexico, to the Anaconda Bluewater mill site to the Ambrosia Lake area only. There are other significant areas in New Mexico that have been impacted.

1. Contaminated land area - 38,000 ACRES [ 60 sections]
2. Contaminated water discharged to natural waters – 600,000 acre feet<sup>1</sup>
3. New Mexico waters now contaminated - 1,203,000 acre feet<sup>2</sup>
4. Estimated loss to New Mexico property owners - \$1,203,000,000. (\$1,000/acre ft. valuation)
5. Waters treated to date - 12,826 Acre Feet<sup>3</sup>
6. Cost to treat 12,826 acre feet - \$30,000,000.<sup>4</sup>
7. Cost to treat 1-acre foot - \$2,339.<sup>5</sup>
8. Contaminates removed by treatment of 12,826 acre feet to date:  
166,662,459 lbs. sulfate, 979,012 lbs. uranium, 1,229,405 lbs. molybdenum, 58,765 lbs. selenium
9. Waters remaining that require treatment - 1,109,174 acre feet
10. Cost to treat remaining waters - \$2,783,816,986.
11. Areas remaining to be evaluated includes: Laguna Jackpile, Seboyeta-Marquez, Sohio mill and minesite, East Rio Puerco Drainage, Crownpoint, Churchrock, Navajo Nation Lands, Shiprock Area.
12. Additional cost to residents forced to use municipal water instead of private wells-\$1,308.79 per year.<sup>6</sup>
13. Lost property values in communities downstream from Homestake/Barrick Gold uranium mill tailings, north of Milan – in excess of \$40,000,000.

Compiled by Milton Head for Bluewater Valley Downstream Alliance and MASE.

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<sup>1</sup> History of mine pumping and mill tailings leakages. Compiled by M. Head & A. Gebeau, 2009.

<sup>2</sup> Based on 20% porosity of affected aquifers. Calculated by M. Head, 2009.  
Homestake's 5-yr Review for EPA, 2006.

From NMED representative at public mtg. of NM Indian Affairs Committee mtg., Grants, NM, Oct., 2008.

Cost according the NMED divided by quantity treated according to Homestake 5-yr. review

<sup>6</sup> Based on municipal water rates and right to use 3 acre ft. per annum.

# Homestake Millsite Water Balance by Milton Head BVDA Based on Review of R.S.E. by EQM Inc

All GPM

	Collected	Injected or Rejected		Treated and Removed
San Andreas	1253	1253 Injected		0.00
LTP	121.6	Alluvial Upper Middle	233 re injected	121.00 evaporation pond 6.00 RO plant
Alluvial	40 P-2 well	19.6 re injected		20.40 evap. & trans.
Alluvial	455 (453 to irrigation)	222.95 re injected		232.00 evap. & trans.
Alluvial	250 to R. O.	198 re injected (3 lost?)		49.00 evaporation pond
LTP	0	106 re injected & pond seepage?		0.00
Alluvial	5 to LTP	106 re injected & pond seepage?		0.00
Alluvial	34	34 re injected		0.00
Upper Chinle	142	136.9 re injected		5.10 evap. & trans.
Middle Chinle	242	190.49 re injected		51.51 evap. & trans.
Lower Chinle	75	36.75 re injected		38.25 evap. & trans.
TOTAL	2623	2430.69 re injected		523.26

Collected 2,623 .00 gpm=4,242 acre ft/yr

176 .00 gpm Evaporation ponds

Reinjected &

Injected 2,430.69 gpm=3,931 acre ft/yr

347.26 gpm Evaporation transpiration

523.26 gpm= 846 acre ft/yr

RO Treatment is re injected or is in evaporation ponds.

1,370.00 gpm collected from Alluvial and 3 Chinle Aquifers

523.26 gpm treated and remediated

846.74 gpm recirculated

Fresh Water Injection

San Andreas 1,253 injected for dilution

Net loss or gain to the aquifers caused by current remediation

Fresh water injected 1253gpm – 523.26 gpm removed = 729.74 gpm = 3.23 acft/day Ac ft/day x 365 days  
= 1180 Ac ft /year. Increase in the aquifers.

Table 2

Ground Water Collected and Constituents Removed  
(Reproduced from Hydro-Engineering 2006)

YEAR	SOURCE	TOTAL VOLUME PUMPED (GAL)	SULFATE (SO4) CONC. AMT. (MG/L)	(LB)	URANIUM (U) CONC. AMT. (MG/L)	(LB)	MOLYBDENUM (MO) CONC. AMT. (MG/L)	(LB)	SELENIUM (SE) CONC. AMT. (MG/L)	(LB)
1978	G.W.	27670033	5200	1200620	35	8081	40	9236	2	462
1979	G.W.	46371629	5200	2012095	35	13543	40	15478	2	774
1980	G.W.	39385860	5200	1708978	35	11503	40	13146	2	657
1981	G.W.	91613183	5200	3975155	35	26756	40	30578	2	1529
1982	G.W.	159848025	5200	6935910	35	46684	40	53353	2	2668
1983	G.W.	167018540	5200	7247043	35	48778	40	55746	2	2787
1984	G.W.	203258522	5200	8819519	35	59362	40	67842	2	3392
1985	G.W.	194074421	5200	8421015	35	56680	40	64777	2	3239
1986	G.W.	199326030	5200	8648886	35	58214	40	66530	2	3326
1987	G.W.	180881740	5200	7848576	35	52827	40	60374	2	3019
1988	G.W.	166460826	5200	7222843	35	48615	40	55560	2	2778
1989	G.W.	175780800	5200	7627243	35	51337	40	58671	2	2934
1990	G.W.	164378919	5200	7132508	35	48007	40	54865	2	2743
1991	G.W.	171497720	5200	7441397	35	50086	40	57242	2	2862
1992	G.W.	128398849	4925	5276234	27.2	29134	35.9	38419	1.60	1718
1992	TOE	8544670	12117	864006	53.2	3793	106.5	7595	1.73	123
1993	G.W.	115795020	5011	4841203	28.1	27130	45.4	43885	1.47	1425
1993	TOE	18357680	12117	1856262	53.2	8150	106.5	16315	1.73	265
1994	G.W.	98294087	4423	3624762	26.0	21146	27.3	22349	1.42	1162
1994	TOE	18337680	12117	1854240	53.2	8141	106.5	16299	1.73	264
1995	G.W.	108306398	3256	2942827	16.1	14553	19.2	17355	1.65	1491
1995	TOE	17711370	11370	1680500	54.6	8069	94.4	13952	2.25	332
1995	TAILS	5905740	8191	403680	36.1	1778	89.7	4420	0.15	7
1996	G.W.	122064160	3899	3967919	20.9	21225	26.8	27259	1.92	1950
1996	TOE	15431810	11537	1484295	46.4	5970	105.0	13509	1.29	166
1996	TAILS	9181390	9434	722129	40.2	3077	108.0	8236	0.18	14
1997	G.W.	94465562	4955	3836678	26.9	20892	33.4	25887	3.17	2456
1997	TOE	12029390	11094	1113808	41.8	419	100.0	10040	0.81	81
1997	TAILS	21292900	10284	1827575	45.8	8139	92.4	16420	0.14	25
1998	G.W.	74459130	5088	3161866	29.6	18385	34.8	21625	1.85	1151
1998	TOE	10321780	9870	850257	42.5	3665	95.2	8203	0.73	63
1999	G.W.	117752408	3363	3305027	16.6	16314	14.8	14545	2.06	2024
1999	TOE	8809890	11560	849976	54.3	3993	106.0	7794	0.46	34
1999	TAILS	120550	9420	9478	40.9	41	111.5	112	0.19	0
2000	G.W.	146609842	3358	4108868	18.8	23004	20.6	25206	1.94	2374
2000	TOE	8032870	9734	652590	58.6	3929	118.0	7911	0.34	23
2000	TAILS	12446810	9710	1008685	37.8	3927	127.0	13193	0.30	31
2001	G.W.	144925056	2770	3350438	19.6	23707	21.4	25884	1.65	1996
2001	TOE	9606280	9935	796529	43.1	3455	95.7	7673	0.78	63
2001	TAILS	31465370	8688	2281555	34.6	9086	89.2	23425	0.19	50
2002	G.W.	201357360	2748	4618092	14.9	25040	16.7	28065	1.23	2067
2002	TOE	17975520	9210	1381718	33.4	5011	88.7	13307	0.76	114
2002	TAILS	17817840	7670	1140588	23.5	3495	40.8	6067	0.12	18
2003	G.W.	177727419	2417	3585168	13.8	20470	15.5	22991	0.73	1083
2003	TOE	28418871	9457	2243048	35.6	8444	78.9	18714	4.35	1032
2003	TAILS	8890076	9800	727126	28.0	2078	92.0	6826	0.30	22
2004	G.W.	154422720	2272	2931913	11.3	14633	16.6	21386	0.79	1017
2004	TOE	26720928	8007	1787722	31.9	7115	67.6	15102	2.78	622
2004	TAILS	44745696	6360	2377848	23.1	8637	60.9	22769	0.20	75
2005	G.W.	130810679	2478	2705346	11.8	12883	15.5	16922	0.59	644
2005	TOE	20704320	8228	1421784	43.5	7517	87.5	15120	2.63	454
2005	TAILS	45685786	4389	1673497	18.7	7130	56.3	21467	0.18	69
SUM G.W.		3,802,954,938		138,498,130		868,988		1,015,176		55,728
SUM TOE		179,594,419		15,993,167		62,637		141,293		2,727
SUM TAILS		197,552,158		12,172,162		47,387		122,935		311
COMBINED SUM		4,180,101,515		166,663,459		979,012		1,279,405		58,765

NOTE: Average concentrations for 1978 to 1991 were used in calculating the quantities of constituents removed.  
Concentrations from the collection wells have gradually decreased from 1978 through 1991.  
G.W. = Ground water; TOE = Toe drains on edge of tailings; TAILS = Large tailings collection wells

GW 1978-2005  
Toe 1992-2005  
TAILS 1985-2005

# Homestake Site: Original MCLs VS New ACLs

**Table 7**  
Current Ground Water Protection Standards for the Site *Original mid 1970's Thru 2006*

Constituent	NRC (License SUA-1471) Ground Water Protection Standards	NMED (DP-200) Ground Water Cleanup Levels
Uranium	0.04 mg/l <sup>(1)</sup>	5.0 mg/l
Selenium	0.10 mg/l <sup>(1)</sup>	0.12 mg/l <sup>(1)</sup>
Molybdenum	0.03 mg/l <sup>(1)</sup>	1.0 mg/l (Irrigation)
Vanadium	0.02 mg/l <sup>(1)</sup>	N/A
Chromium	0.06 mg/l <sup>(1)</sup>	0.05 mg/l
Radium-226 and Radium-228	5.0 pCi/l	30.0 pCi/l
Thorium-230	0.30 pCi/l <sup>(1)</sup>	N/A
Sulfate	N/A	976 mg/l <sup>(1)</sup>
Chloride	N/A	250 mg/l
TDS	N/A	1770 mg/l <sup>(1)</sup>
Nitrate	N/A	12.4 mg/l <sup>(1)</sup>

Note (1) Established based on Site specific ground water background concentrations

**Table 8**  
Proposed/Revised Ground Water Cleanup Levels for the Site *Now Approved - 2007*

Constituent	Ground Water Cleanup Levels				
	Alluvial Aquifer	"Mixing Zone" Aquifer	Upper Chinle Aquifer	Middle Chinle Aquifer	Lower Chinle Aquifer
Uranium, mg/l	0.16	0.18	0.09	0.07	0.02
Selenium, mg/l	0.32	0.14	0.06	0.07	0.32
Molybdenum, mg/l	N/A	N/A	N/A	N/A	N/A
Sulfate, mg/l	1500	1750	914	857	2000
Chloride, mg/l	N/A	N/A	412	250	634
TDS, mg/l	2734	3140	2010	1560	4140
Nitrate, mg/l	12	15	N/A	N/A	N/A

MCLs

ACLs

# Rio Algom Mill site Ambrosia Lake Area Formerly Kerr McGee

Table 1  
Proposed ACL Concentrations

Contaminant	Alluvial Aquifer	Tres Hermanos B	Tres Hermanos A	Dakota
Molybdenum (mg/L)	176	—	—	—
Nickel (mg/L)	98	6.8	—	6.8
Selenium (mg/L)	49	—	—	—
Gross alpha (pCi/L)	8,402	—	—	—
Radium-226 & -228 (pCi/L)	3,167	218	218	218
Thorium-230 (pCi/L)	13,627	945	945	945
Natural uranium (mg/L)	23	1.6	—	1.6
Lead-210 (pCi/L)	1,274	88	88	88
Chloride (mg/l)	7,110	2,810	1,070	3,200
Nitrate (mg/l)	351	7.7	9.2	22.8
Sulfate (mg/l)	12,000	4,760	2,584	6,480
TDS (mg/l)	26,100	11,700	6,400	14,100

New Mexico  
Standards  
WDCC

1.0

0.2

0.05

15

30.0

0.03

50

250

10

600

1000

6-9

PH

Approving ACLs means that ground water is in compliance; therefore, the CAP would be terminated and site reclamation would be completed subsequently. In addition, a ground water compliance monitoring program would be implemented consisting of POC monitoring, trend, and POE wells for the aquifers at the long-term surveillance and institutional control boundary surrounding the facility.

## 5.0 TECHNICAL EVALUATION

### 5.1 ENVIRONMENTAL SETTING

#### 5.1.1 Geology

##### 5.1.1.1 Regional Geology

The site is located north of the Zuni Uplift portion of the San Juan Basin. The basin is characterized by broad areas of relatively flat-lying sedimentary rocks, dipping to the northeast; portions of the basin are covered with alluvium and basalt flows. The site is within the Ambrosia Lake valley, which is formed by the Mesa Montanosa to the west and the San Mateo Mesa to the east. Stratigraphic units of hydrologic significance at the site are, in descending order, the alluvial aquifer, Mancos Formation, TRA and TRB sandstones, Dakota Sandstone, and the Brushy Basin

### 3.3.4 Environmental Monitoring

#### 3.3.4.1 Groundwater Monitoring

3I Groundwater monitoring is required at the L-Bar site. The monitoring network consists of ten DOE wells located on or adjacent to the site and two Moquino Water Users Association wells located approximately 2 miles west of the site in the village of Moquino. Table 3-2 lists the wells that are in the monitoring network. Samples are analyzed for chloride, nitrate (nitrate + nitrite as nitrogen), selenium, sulfate, total dissolved solids, and uranium. Analytical results will be compared to the alternate concentration limits (ACL) and alternative abatement standards (AAS) provided in Table 3-3.

*Table 3-2. Groundwater Monitoring Network  
for the L-Bar, New Mexico, Disposal Site*

Monitor Well	Network Application
MW-1A	POC source zone well
MW-17B	POC source zone well
MW-29A	Background well
MW-61	Seepage indicator well
MW-62	Seepage affected area indicator well
MW-63	POE seepage indicator well
MW-69	POC source zone well
MW-72	POE well on east property boundary
MW-81	POC source zone well
MW-100	POE well on west property boundary
Moquino Well (new)	Water users supply well in Moquino
Moquino Well (old)	Backup supply well in Moquino

Key: POC = point of compliance; POE = point of exposure

*Table 3-3. Groundwater Alternate Concentration Limits and Alternate Abatement Standards  
for the L-Bar, New Mexico, Disposal Site*

Analyte	New Mexico Standard	ACL (MW-1A, 17B, 69, 81)	AAS Source Zone (MW-1A, 17B, 69, 81)	AAS Affected Area (MW-62)
Chloride (mg/L)	250	N/A	1,127	N/A
Nitrate (mg/L)	10.0	N/A	1,180	N/A
Selenium (mg/L)	0.05	2.0	2.0	N/A
Sulfate (mg/L)	4,000 <sup>a</sup>	N/A	13,110	5,185
TDS (mg/L)	5,880 <sup>a</sup>	N/A	20,165	7,846
Uranium (mg/L)	5.0	13.0	13.0	N/A

<sup>a</sup>Background value.

Key: AAS = alternate abatement standard; ACL = alternate concentration limit; mg/L = milligrams per liter; N/A = not applicable; TDS = total dissolved solids

The intent of the annual monitoring is to determine the effect of discontinuing the barrier well pumping on groundwater quality at the site. If annual monitoring results demonstrate that seepage from the impoundment is under control (i.e., no significant upward trends in wells MW-61, MW-62, and MW-63), after 3 years the sampling frequency will be reduced to once every 3 years in accordance with the LTSP. Groundwater monitoring will continue as long as a New Mexico Standard (Table 3-3) is exceeded in any well.

## Red Water Pond Road Resident

PTSS, AUM PTSD [Abandoned Uranium Mine (AUM), Post-traumatic stress disorder (PTSD)]

Trauma (including **post-traumatic stress syndrome (PTSS)**) experienced by Native Americans as a result of colonialism and its aftermath (boarding schools, relocation/removal, and so on). There are definitely connections between what we're experiencing/describing, and what's being talked about at Red Water Pond Road.

### *The Role of Dependency and Colonialism in Generating Trauma in First Nations Citizens.*

*Defining Trauma:* The concept of trauma figures more and more in the literature of First Nation. It appears the concepts, and, in particular, the experience of PTSD, is employed as a form of metaphor for the consequences of economic and social dependence experienced by First Nation citizens.

*The basic definition of trauma is that of a shock that is deemed emotional and substantially damages, over a long time period, the psychological development of the victim, often leading to neurosis. The discussion of the effects of trauma on First Nation citizens usually centers around PTSD. Even with this definition of Trauma, one remaining question is: What constitutes a traumatic event?*

*Defined a traumatic event as a nonordinary human experience that may lead to PTSD, and which would be distressing to most people, such as serious harm or threat to self, spouse, children, close relatives or friends; witnessing a serious accident or violence against another person, who, as a result, is either killed or seriously or injured; or having one's home or community suddenly destroyed.*

*In order to receive the diagnosis of PTSD, an individual has to "persistently experience" the traumatic event, persistently try to avoid stimuli associated with the even, experience an increased arousal (i.e., trouble falling asleep, irritability, or hyper vigilance) and, finally, suffer fro these symptoms for at least 1 month. PTSD is, in fact, classified under anxiety. Symptoms accompanying anxiety disorders, such as dissociative, depressive, or somatic, arise when the body is having conditioned emotional response to fear, severe stress, and loss.*

The uncertainty and fears about living with long-term, chronic exposure to radiation have affected Nez's family not only physically but psychologically. Their reactions remind Mr. Nez, a Vietnam veteran, of the symptoms of post-traumatic stress syndrome that he and his comrades suffered after their combat experiences during the war. Similar PTSS in Navajo/Hopi Land Dispute, relocatee. People in his family are on edge, easily startled and angered at times. At other times, they feel numb, unable to express emotions toward friends and loved ones. Some family members try to avoid reminders of the fact that they live just a few yards from contaminated soil that's 50-120 times normal background radiation levels.

But it's no use – not talking about it does not remove the fears from their minds – fears about loved ones who are sick, about the damage already done and about whether their children have been placed at future risk. The burden of guilt and worry and lack of control creates a relentless pressure. That worry creeps into their sleep: they experience vivid, intense nightmares about the mines and about disease, where the earth that is supposed to nurture them becomes a dangerous no man's land. Those who are old enough to remember the time when the mines were in operation have waking dreams and flashbacks in which they hear the dull, dreadful roar of the generators and the rumble of uncovered trucks that used to haul off tons of radioactive soil, billowing across the valley and settle on their land.

Children, meanwhile, respond to simple triggers, like hearing the word "uranium" at school, and even the word "yellow," which calls to mind uranium *yellowcake*. These simple, seemingly harmless words distract them from their schoolwork as they obsess about whether their family and animals are safe. Nez's 12-year-old grandson checks their sheep, concerned that some appear to be turning yellow as they graze at the edge of the contaminated arroyo, no more than a stone's throw from their home.

Is it post-traumatic stress syndrome? There is a growing body of academic study to support this idea. Research has shown how the legacy of colonialism, violence, relocation and assimilation have created long-term symptoms of trauma among Native Americans.

Residents of Redwater Pond Road say that they have been traumatized by watching their loved ones suffer with disease, and by the knowledge that they are living – day in and day out – surrounded by radioactive air, water, plants and soil. They feel that their land and physical well-being has been invaded. They fear relocation, a powerfully charged word that is heavy with the history of forced removal of Native peoples from their land. Mr. Nez's family exists in a state of limbo, uncertain of how long they'll be able to remain on their beloved homeland, where the family has lived for at least seven generations. They fear that, if they're forced to move, they will not be able to continue their way of life, with children raised among grandparents who can pass down their traditions.

Already some of the younger generations have left. They are reluctant and sad to do so, but those who have left are also unwilling to knowingly place their children in harm's way. No one told their parents and grandparents of the dangers of the mines. In good conscience, some of the younger adults say, they cannot knowingly subject their children to these dangers. But their decision to leave forces an enormous sacrifice. They are losing the closeness, the cohesiveness of their family and their traditions. They are forced to sacrifice their children's cultural education to protect their health.

The entire family is suffering psychological stress as they see loved ones succumb to cancer, respiratory problems and a host of other suspicious symptoms. They are caught between protecting their health, and protecting their culture and family life – an undesirable choice, to say the least. They've waited decades for information and for action. They do not want to have to choose between their health and their way of life.

**We need to address the following area:**

Living near AUM (NECRM) is very disturbing, stressful (traumatic), experiencing and witnessing traumatic.

**We ask for Long-term Protection:**

- **Human Health** (Physical, Mental, place of Residence, Social determinants of health)  
Our disorders (**Headache, Respirator, Lung, Kidney, Skin, Food borne Pathogens, diarrhea, Bone** and others)
- **Environment** (water, air, grounds, vegetation, light), **traditional medicine, sacred site area**
- **Treatment** for post-traumatic stress disorder/post-traumatic stress syndrome includes counseling and medicines, such as antidepressants and ant anxiety medicines using (**Western Medicine and Traditional Medicine**). Should be address in a Health Care.
- Sheep or animal health study
- And Others

Teddy Nez, 29E Red Water Pond Road

